CLAIMS

1. A method for encoding data for transmission over a transmission channel in a digital communication system, the method comprising:

selecting an appropriate variable length product code for variable length data to be transmitted; and

encoding said data by means of said selected product code.

2. The method according to claim 1, wherein said variable length product code is selected in accordance with parameters selected from size of data packet, Quality of Service terms, and channel conditions at the time of transmission.

3. The method according to claim 1, further comprising transferring the encoded data packets over the transmission channel by means of a data protocol

4. The method according to claim 1, wherein the data is encoded in such a way as to provide scalable decoder complexity.

5. The method according to claim 1, wherein said step of encoding includes encoding data by means of a Hamming Product Code.

6. The method according to claim 1, wherein said step of encoding includes encoding data by means of a Parity Check Product Code.

7. The method according to claim 1, wherein the step of encoding includes selecting the product code by means of the following algorithm:

Algorithm 1: Finding the preferred block dimensions for a given data length

Let K be the data length (in bits), then the algorithm finds a factorization $K= k_1 \times k_2$ such that for $k_1 \geq k_2$ the dimension ratio k_2/k_1 is maximum

1. Start with $k_1 = \text{Round}(\text{Sqrt}(K))$, $k_2 = k_1$.

2. If Reminder(K/k_1)=0 then $k_2=K/k_1$ – FINISH (go to 7).
3. Set $k_2 = k_2-1$.
4. If Reminder(K/k_2)=0 then $k_1=K/k_2$– FINISH (go to 7).
5. Set $k_1 = k_1+1$.
6. If $k_2 > 0$ go to (2).
7. Output k_1 , k_2.

8. The method according to claim 5, wherein the step of encoding includes selecting the product code by means of the following algorithm:

Algorithm 2: Constructing Preferred Hamming Product Code (HPC)

The code-block dimensions may be produced by the following :
Define a function P(x):
$P(x) = 5$ if $1 \le x \le 11$
$P(x) = 6$ if $12 \le x \le 26$
$P(x) = 7$ if $27 \le x \le 57$ (for $x > 57$, P is not defined)

And the product code is: $(n_1, k_1) \times (n_2,k_2)$,
where $n_1=k_1+P(k_1)$, $n_2=k_2+P(k_2)$

9. The method according to claim 5, wherein the step of encoding includes selecting the product code by means of the following algorithm:

Algorithm 3:

Finding the block dimensions HPC(m1,m2,S1,S2) for a given data length and minimal interleaver length
Let K be the data length (in bits), and n and minimal interleaver length, then the algorithm finds a factorization $K=k_1 \times k_2$ such that the largest dimension of the resulting code-block is $\ge$ n.

0. Define a function P(x):
$P(x) = 5$ if $1 \le x \le 11$
$P(x) = 6$ if $12 \le x \le 26$
$P(x) = 7$ if $27 \le x \le 57$ (for $x > 57$ - P is not defined)

1. Start with k_1 = Round(Sqrt(K)) , $k_2 = k_1$.
2. If Reminder(K/k_1)=0 then:
- $k_2=K/k_1$.
- $k=\max(k_1,k_2)$, $m=k+P(k)$
- if $m \ge n$ – FINISH (go to 7).
3. Set $k_2 = k_2-1$.
4. If Reminder(K/k_2)=0 then:

- $k_1=K/k_2$.
- $k=\max(k_1,k_2)$, $m=k+P(k)$
- if $m \geq n$ – FINISH (go to 7).

5. Set $k_1 = k_1+1$.
6. If $k_2 > 0$ go to (2) , else STOP : "Impossible interleaver length".
7. Output k_1 , k_2 and $n_1=k_1+P(k_1)$, $n_2=k_2+P(k_2)$

10. A system for encoding data for transmission over a transmission channel in a digital communication system, the system for encoding comprising:

a code selecting unit arranged to select a variable length code which is most suitable for variable length data to be encoded; and

an encoder encoding said variable length data with said selected variable length product code.

11. The system according to claim 10, further comprising means for providing parameters of said selected code to the encoder.

12. The system according to claim 10, wherein said code selecting unit includes means for receiving parameters selected from size of data packet, Quality of Service terms, and channel conditions in order to selected said selected code.

13. The system according to claim 10, further comprising:

a variable length product decoder arranged to decode said encoded data; and

a decoding method selecting unit for selecting, for a given data packet, a method of decoding from the group consisting of hard decision decoding, soft decision decoding, and iterative soft decision decoding.

14. The system according to claim 10, wherein:

said digital communication system includes a base station and at least one subscriber unit; and

the encoder is mounted in said subscriber unit;

wherein said base station includes:

a code selecting unit arranged to select a variable length product code which is most suitable for variable length data to be encoded; and

a transceiver for transmitting parameters of said selected code to said encoder in said subscriber unit.

15. The system according to claim 14, wherein said base station further comprises:

a variable length product decoder arranged to decode said encoded data; and

a decoding method selecting unit for selecting a method of decoding for the variable length product decoder from the group consisting of hard decision decoding, soft decision decoding, and iterative soft decision decoding.

16. A data decoder comprising:

a variable length product decoder, including apparatus for performing hard decision decoding, soft decision decoding, and SISO iterative decoding; and a mechanism for selecting one of said methods of decoding for a received data packet.